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(54) BIPOLAR ELECTROLYTIC FILTER PRESS CELL FRAME

(71) We, BASF WYANDOTTE CORPORATION, a corporation organized under the laws of the State of Michigan, United States of America, of 1609 Biddle Avenue, Wyandotte, State of Michigan, United States of America, do hereby declare the invention, for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:–

The present invention pertains to electrolytic filter press cells. More particularly, the present invention pertains to cell frames for electrolytic filter press cells. Even more particularly, the present invention pertains to cell frames for bipolar electrolytic filter press cells.

As is known to those skilled in the art, a cell frame constitutes the basic repeat unit in an electrolytic filter press cell. The cell frame functions as a separator or barrier between the anode of one cell and the cathode of the adjacent cell. A linear series of cathodes, anodes and interposed cell frames constitutes a filter press cell, in toto.

The prior art is replete with a wealth of technology respecting filter press cells. Generally, however, the prior art has paid a great deal of attention to electrode construction, diaphragm materials and the like. On the other hand, little attention has been directed to the cell frame and means and methods for improving same.

In U.S. Patent Specification No. 3,836,448 there is disclosed a frame for a filter press cell which is divided into an upper zone and a lower zone. The upper zone is used to collect the gases evolved during the electrolytic process conducted in the lower zone. A plurality of apertures are formed in the frame structure to provide communication between the two zones. This reference, also, teaches the necessity of separate frames for the cathode and anode, as well as the need for the frames to be free of electrical insulating partitions. It is to be appreciated that the frame structure is complex in that separate frames for the anode and cathode must be provided. Also, the need to be free of electrical insulating partitions requires separate structure therefor. This renders such structure expensive to manufacture.

Also, U.S. Patent Specification No. 3,252,883, teaches a cell frame for an electrolytic diaphragm cell. The reference teaches laterally spaced outlets for the gases evolved during the electrolytic process. According to this reference, however, the diaphragm must occupy substantially the entire space within the frame. Thus, the frame cannot be utilized in an electrolytic process which does utilize a diaphragm or where the diaphragm does not occupy the entire space within the frame. This negates any concept of a universally employable cell frame.

Other prior art background material can be found in U.S. Patent Specifications Nos. 3,856,652; 3,855,104; 2,522,681; 1,366,090 and 3,647,672.

The present invention, as will be appreciated from the detailed description thereof, provides a cell frame of improved construction which is particularly useful in the electrolysis of brine. The frame hereof, also, includes means for prolonging the useful life thereof as well as facilitating the installation thereof.

In accordance with the present invention, there is provided a bipolar electrolytic filter press cell frame having internal gas disengagement means associated therewith; the cell frame comprises (a) a peripheral rim, (b) a T-shaped central barrier recessedly disposed within the rim, one side of the barrier defining a catholyte side and the other an anolyte side, (c) the portion of the frame extending from the top of the barrier downwardly defining a lower zone at which elec-

trolysis is carried out, (d) the portion of the frame extending upwardly from the top of the barrier defining an upper zone for disengaging the electrolysis-generated gases, and (e) a panel downwardly extending and secured to the central barrier to the anolyte side of the barrier.

The upper section will normally include a segmented or compartmented region, each compartment defining a gas-receiving chamber and internal headers diverting the gas to its proper or respective chamber. The panel referred to earlier (see (e) above) will normally extend across the cell frame and be disposed intermediate the upper and lower sections so as, in use, to separate the anolyte products from the catholyte products of an adjoining cell frame immediately above the lower section.

the present invention further includes improved means for sealing and handling the frames hereof.

The invention will now be described, by way of example only, with reference to the accompanying drawing. In the drawing, like reference characters refer to like parts throughout the several views and;–

Figure 1 is a front elevational view of an electrolytic filter press cell frame in accordance with the present invention, and

Figure 2 is a cross-sectional view of the electrolytic filter press cell frame of FIG. 1 taken along the line 2-2 thereof.

With reference to the drawing, there is depicted therein a bipolar electrolytic filter press cell frame, generally indicated at 10. The frame comprises a first or lower section or zone 12 and second or upper section or zone 14. The lower zone 12 defines the electrode area where the electrolytic solution is electrolyzed and the upper zone defines the gas collection or disengagement area.

With more particularity, the cell frame 10 comprises an integral unit which is injection molded or likewise formed from a synthetic resinous material which is compatible with the electrolytes, such as filled or unfilled polypropylene.

The frame is molded such that there is provided a peripheral rim 16 extending therearound and a recessed central barrier or web 18.

The area of the frame extending downwardly from the top of the web 18 defines the lower zone of the frame.

As clearly shown in FIG. 2, the central barrier 18 comprises a T-shaped member 20 having a linear section 22 and legs 24, 26 extending laterally therefrom. One leg 24 is associated with the anode side of the frame. The other leg 26 is associated with the cathode side of the frame. Each leg 24, 26 is provided with a plurality of exhaust ports 23, 25, respectively, which provide gas disengagement means in a manner to be described subsequently.

The central barrier section 22 is provided with a plurality of apertures 28. The apertures 28 receive bipolar connectors 30 therethrough. Although any bipolar connector can be effectively used herein, the central barrier 18 is configured to accommodate the bipolar connector as described in U.S. Patent No. 3,788,966.

As is known to those skilled in the art, the bipolar connectors 30 support the anode 32 and the cathode 34. Thus, the space between the anode 32 and the section 22 defines the anolyte compartment. The space between the cathode 34 and the section 22 defines the catholyte compartment. It should be noted with respect hereto that if conventional electrodes are deployed, then a plurality of support nubs (only one of which is shown at 36 in Figure 2) can project outwardly from the barrier to additionally support the electrodes. The nubs 36 are generally formed integrally with the barrier section 22 and project laterally outwardly therefrom and substantially perpendicular thereto. Ths use of support nubs is more particularly described in our copending Application No. 52301/75 (Serial No. 1528389).

Downwardly depending from the free end of leg 24 is a panel 38. The panel 38 extends across the center of the cell frame 10. The panel 38 is secured to the leg 24 by heat welding or the like. The panel separates, respectively, the anolyte and catholyte products of adjacent cells immediately above the central web 18. As shown in FIG. 2, the panel is provided at its free end with a recess 40. The recess 40 provides a mounting area for a cell separator, such as a diaphragm 42. The diaphragm 42 is mounted in the recess 40 by any conventional mode.

The upper zone 14 comprises a plurality of chambers or internal headers 44, 46, 48. The chambers communicate with either the anolyte or catholyte side of the lower zone 12 via apertures 23 or 25. As shown in the drawing, the headers 44 and 48 communicate with the anolyte side and the header 46 communicates with the catholyte side.

The means (not shown) are connected with the chambers at the end of the filter press module for withdrawing the gases.

The panel is extremely efficacious in asbestos diaphragm cells since it provides a space above the diaphragm for diversion of the gases to upper zone 14. Diversion of the gases, in this manner, decreases electrolyte turbulence at the upper edge of the diaphragm thereby increasing its operating or useful life. The gases generated travel upwardly through apertures 23, 25, and into the upper zone.

The frame 10 includes headers 50, 52 disposed at the bottom thereof. Each of the headers includes an opening 54, 56, respec-

tively, which communicates with internal bores 58, 60. The internal bores are smaller in diameter than their associated openings 54, 56 to minimize current leakage between cells through the electrolyte. One of the bores 58 or 60 opens into the anolyte compartment and the other into the catholyte compartment. Thus, one header comprises electrolyte feed means and the other header comprises exhaust means for liquid product.

As hereinbefore noted the central barrier is recessed within the peripheral rim 16. By providing the recessed configuration the support grid of a deposited diaphragm can be mounted to the frame with the support being disposed within the recess of the panel. The deposited diaphragm can be secured to the barrier through pins inserted into corner apertures 62. A polymeric sheet diaphragm or separator can also be used herein. In such instance sealing is achieved at the peripheral rim and between the panel and pressure bar. In order to prevent distortion caused by the gases generated on the cathode side of the cell frame and to facilitate withdrawal of the gases, and to insure sealing at the upper edge of the separator, the present invention may further include a pressure bar 64. The pressure bar 64 extends across the cell frame 10 within the recessed portion thereof. The use of a pressure bar is more particularly described in our copending Application No. 20430/76 (Serial No. 1546964).

As shown in the drawing, mounted on each side of the frame 10 are handles 66, 68. Each handle includes a shoulder 70, 72. The shoulder portion of the handles seatingly engage and rest upon filter press frame supports conventionally disposed within a filter press cell. The handles, preferably, are integrally formed with the peripheral rim of the frame.

Disposed on each lateral side or face of the frame is a pair of laterally extending projections 74, 76, 78 and 80, respectively. The projections are disposed above and below the handles 66, 68 as shown. Preferably, the projections have throughbores 82 extending therethrough.

The projections 74, 76, 78 and 80 support the protection rods (not shown) of the filter cell and which extend through the bores 82. As is known to those skilled in the art the production rods are employed to prevent the possible opening of the press in the event of hydraulic failure. The rod, also, holds the frame together in the cell when the press is broken for removing a failing frame or separator.

As shown in FIG. 1, an aperture 84 is provided above the upper zone 14. The aperture 84 is utilized to lift the frame 10 during assembly of the filter press cell module.

Although not shown in the drawing, the frame 10 contemplates the sealing thereof with a gasket secured to the frame about the periphery thereof. Separate gaskets are deployed about the headers. The peripheral gaskets are provided on both sides of the frame.

It is to be appreciated that the present invention provides an automatic separation of products, and is extremely efficacious in the production of chlorine and caustic by brine electrolysis.

WHAT WE CLAIM IS:–

1. A cell frame for a bipolar electrolytic filter press cell, the cell frame comprising:–

(a) a peripheral rim,

(b) a T-shaped central barrier recessedly disposed within the rim, one side of the barrier defining a catholyte side and the other an anolyte side,

(c) the portion of the frame extending from the top of the barrier downwardly defining a lower zone at which electrolysis is carried out,

(d) the portion of the frame extending upwardly from the top of the barrier defining an upper zone for disengaging the electrolysis-generated gases, and

(e) a panel downwardly extending and secured to the central barrier on the anolyte side of the barrier.

2. A cell frame as claimed in claim 1 wherein the portion of the rim above the top of the central barrier includes (a) at least one header communicating with the catholyte side and (b) at least one header in communication with the anolyte side, the headers being formed in the frame and defining the upper zone such that the upper zone is disposed within the rim.

3. A cell frame as claimed in claim 2 wherein each leg of the T has a plurality of apertures formed therein such that in use of a cell containing the frame the generated gases travel upwardly therethrough into their respective headers.

4. A cell frame as claimed in any one of claims 1 to 3 which includes:–

(a) a handle formed on each side of the frame, each handle seatingly engaging a filter press frame support,

(b) at least one projection on each side of the frame, the projections supporting the filter press protection rods, and

(c) means for facilitating the lifting of the frame formed at the top thereof in the rim.

5. A cell frame as claimed in any preceding claim which includes:–

(a) means for feeding electrolyte solution to the anolyte side of the barrier, such means being formed in the rim, and

(b) means for exhausting catholyte liquid product from the catholyte side of the barrier, such means being formed in the rim,

the means for feeding and the means for exhausting being disposed in the lower

zone.

6. A cell frame as claimed in claim 1 and substantially as hereinbefore described with reference to, and as illustrated in, the accompanying drawings.

7. A bipolar electrolytic filter press cell comprising a cell frame as claimed in any preceding claim.

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1547581 COMPLETE SPECIFICATION
1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

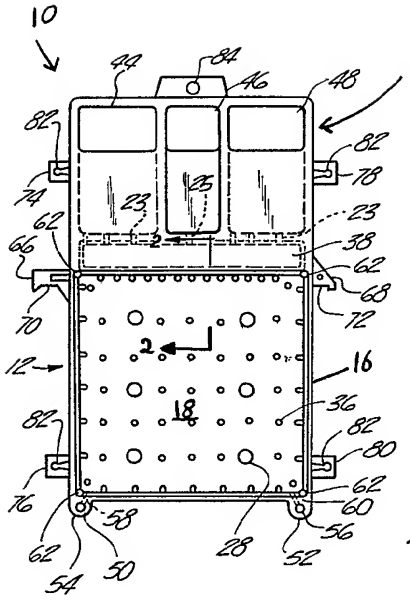

Fig - 1

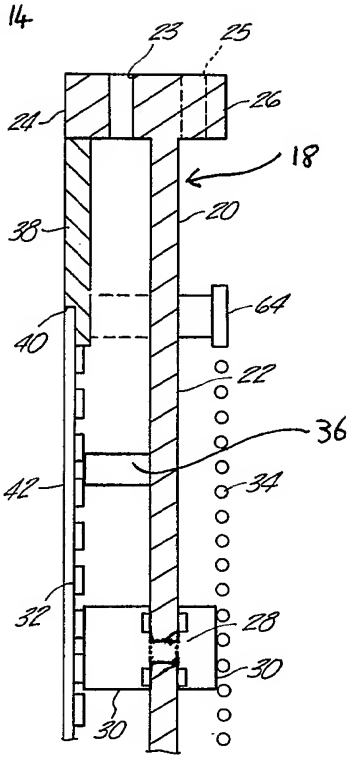

Fig - 2